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GUIDELINES FOR GEOPHYSICAL REPORTS FOR ENVIRONMENTAL AND ENGINEERING GEOLOGY

GENERAL INFORMATION

These guidelines suggest a format for reports. They do not include complete listings of techniques or topics, nor should all techniques described be used or all topics listed be dealt with in every project.

These guidelines are informational and are not regulations. Language used has been carefully gleaned of mandatory requirements. The guidelines have no force of law and do not set standards of practice. To be enforceable, the guidelines would have to be adopted as regulations in accordance with the Administrative Procedures Act.

On January 23, 1986, the Board of Registration for Geologists and Geophysicists (Board) passed the following resolution:

"The Guidelines have been adopted as useful information documents. Not having been adopted as regulations in accordance with the Administrative Procedures Act, the Guidelines are not legally enforceable."

These guidelines have their roots in eight California Division of Mines and Geology notes, that were published in California Geology during 1973-75. The four guidelines that evolved through the Technical Advisory Committee for the Board of Registration from 1983 to 1989 are:

Guidelines for Engineering Geologic Reports.
Geologic Guidelines for Earthquake and/or Fault Hazard Reports.
Guidelines for Geophysical Reports.
Guidelines for Groundwater Investigation Reports.

I. INTRODUCTION

These guidelines are prepared by the Technical Advisory Committee of the Board and adopted by the Board on February 20, 1998 to assist those involved in preparing geophysical reports. The guidelines represent the general procedure for reporting on the application of geophysical methods to engineering geology and environmental projects. It will be helpful to consider the items described below when planning the field and laboratory work and writing the reports.

These Board guidelines describe the scope of work normally done and suggest a format for reports. They do not include complete listings of techniques or topics, nor should all

techniques described be used for all topics. The listings do not imply that all techniques described be used or all topics listed be addressed in every report.

The guidelines are applicable within the context of protecting the public's health, safety and welfare especially where the geophysical work is related to projects concerning seismic design, ground water, geologic or environmental hazards, or construction. These guidelines are not intended or designed for projects related to mineral or energy exploration except where such activities of surface facilities affect public health, safety, and welfare, i.e. sludge pits; brine pits; and seepage, drilling or injection of brines.

Information on the purpose and scope of a geophysical survey should be included in the report. There may be constraints on the nature of the geophysical survey, such as constraints on accessibility, or constraints on funds available, or constraints inherent in the geophysical methods used. Such constraints can be clearly identified in the report. If the geophysical report is appended to another report, the geophysical report should indicate its intended use.

Although these guidelines are intended to be relatively complete, they may not include certain items that might develop in a specific survey. Consequently, the geophysicist will rely on professional judgment in providing pertinent information to make the report as complete as possible.

II. RESPONSIBILITY OF SIGNATORY TO GEOPHYSICAL REPORTS

Interpretation of geophysical data usually involves a knowledge of both geological and geophysical principles, and of the limitations of the geophysical methods, data collected, assumptions and ambiguities of interpretation. Geophysical reports which fall within the scope of the Act (Article III, Chapter 12.5 of the Business and Professions Code) must be done by or under the direct supervision of a professional geophysicist, who then indicates responsibility for the work by signing the report.

For many projects, geophysical work constitutes only a portion of the total investigation. However, reports which contain interpretations or conclusions based on geophysical data must include the signature and license number of the professional geophysicist whose signature thereby indicates responsibility for only the geophysical portion of the final report (Article III, Chapter 12.5 of the Business and Professions Code). The signed geophysical report may be appended to the geological or engineering report. Thus, if other registered or certified professionals are involved, the final report may be signed by a geologist, engineering geologist, hydrogeologist or civil engineer if that person understands and accepts the geophysical results and conclusions.

III. REPORT CONTENTS

A. Reports commonly include the following information:

1. Scope and purpose (including goals and objectives) for which report was prepared and limitations placed on the investigation. Should include a statement about whether the report is interim, final or a progress report and how the report should be used, such as for preliminary planning, design, legal, etc.

2. A brief discussion, if applicable, covering the site history, site use, pertinent regulations, and any other background information useful to the reader.

3. Nature and source of available surface and subsurface geological, engineering, and/or geophysical information published and unpublished. Suitable explanations will provide any technical reviewer with the means to assess the reliability of the published and unpublished data. (Subsurface relationships can be determined or inferred, for example, by interpretation of the geophysical data, by projection of geological or geophysical data from adjacent areas and by use of borehole logs. It is evident that different sources of information can differ markedly from one another in degree, detail and/or reliability according to the method used and according to the source of information.)

4. Brief but complete descriptions of all natural materials within the subject area (rocks, soils, etc.) along with appropriate descriptions of the hydrogeology (depth to water, number of aquifers, etc.). If the geophysical report is to be independent of a geologic or engineering report, it may include adequate descriptions of geologic materials, structures, etc. (see Guidelines for Engineering Geologic Reports), with an explanation of the source of these data. If the geophysical report is part of a geologic or engineering report, such descriptions need not be repeated in the section pertaining to geophysics.

5. Location and size of subject area to be investigated.

6. Type of geophysical survey or surveys. Detailed descriptions of the methodology and/or the quality control (including calibration) procedures may be discussed here or in an Appendix. This section should include a discussion of rationale for using a specific geophysical method(s) which relates to coverage, accuracy, resolution, etc.

7. Limitations which may influence the quality of the geophysical data. These may include sources of interference within or near the subject area (e.g., magnetic storms, pipelines, electric lines, buildings, truck traffic, wind noise, etc.). Specific local interference may be shown on the survey map. The report would also include a discussion of the extent to which the data and interpretations might be influenced by these factors.

8. Who did the geophysical survey, when the survey was done, and how the survey was done (including setting up base stations, placing a grid, direction of traverses, etc.).

9. Type, make, and model of geophysical instruments; sensitivity, calibration and limitations of instruments.

10. Strengths and weaknesses of methodology used.

B. <u>Reports should also generally contain the following survey specific information</u>:

1. A discussion of how the survey has been tied with existing data (e.g., by extension of survey into adjacent areas).

2. Geologic and/or topographic base maps of suitable scale, with the nature and source of the base maps clearly identified. For larger-scale surveys, U.S.G.S. topographic maps are a preferred source.

3. Maps on which survey lines and/or locations for recordings are clearly identified and tied to established survey points, or to permanent landmarks if established survey points are not available. Locations of samples collected for laboratory tests or measurements may be shown on the same or comparable maps.

4. An appendix which includes pertinent field data, reduction of data and the calculations employed. This section should include a discussion of the rationale for a particular data processing plan. Also pertinent are references to computer reduction of data and/or modeling (including as applicable: the program name, where developed or published, program modifications and type of computer used). Where field data are printed directly from the instrument on a paper record, such records need not be submitted, so long as the report includes those values used in the analysis and a reference is made to the place where these data are stored.

5. An explanation of any range of values that is recorded at a station, with a rationale for the selection of the value that is used in the analysis and interpretations.

6. Correlation, or lack of correlation, of geophysical values with geologic materials or hydrologic units.

7. A description of supplemental laboratory tests or measurements, if utilized, including methods, resulting data and reasons why the work was done. When such work is done by other professionals, their signatures will be included as appropriate to indicate their responsibilities.

8. Maps of geophysical results and pertinent data at an appropriate scale and in sufficient detail to allow adequate evaluation. The discussion of the results and conclusions should be internally consistent in its references to the map so that findings can be located on the ground.

9. Cross-sections based on the geophysical data, and showing where subsurface geologic or engineering information is available and/or where such information has been projected into the plane of the cross sections. Cross-sections will also show the topography and the locations where data were collected, if these locations lie along the line of the cross-section or where the locations have been projected into the plane of the cross-section.

10. If subsurface geologic or engineering information is not available, a clear statement explaining its absence.

11. A discussion of the reliability of the geophysical interpretation, including alternative interpretations where applicable.

12. Recommendations on additional geophysical surveying, if appropriate. Recommendations might also be appropriate regarding the locations of exploratory trenches, borings or wells

13. References cited.

SELECTED REFERENCES

Encyclopedic Dictionary of Exploration Geophysics, Third Edition, compiled by R. E. Sheriff, Society of Exploration Geophysicists, 1991.

Interpretation Theory in Applied Geophysics, Grant, F. S. and G. F. West, McGraw-Hill, 1965.

Applied Geophysics, Telford, W. M., L. P. Geldart, R. E. Sheriff and D. A. Keys, Cambridge University Press, 1976

Introduction to Geophysical Prospecting, Third Edition, M. B. Dobrin, McGraw-Hill, 1976

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